AP Chemistry
Thermochemistry

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Name: _____

Date: _____ Period: ____

1. Which "type" of system best describes a hot bowl of soup?

2. What is the change in internal energy of a system that has 682J of work done on it and gives off 485J of heat?

3. When heat is absorbed by the system from the surroundings, the process is said to be _____, and the sign of $q_{process}$ is _____.

4. Which is not true for an endothermic reaction?
a. The temperature of the surroundings decreases.
b. The enthalpy change for the reaction is positive.
c. Heat flows from the surroundings into the system.
d. The products have a lower enthalpy than the reactants.
e. All of the above are true.

5. What are the signs for q and w if a system absorbs 180J of heat energy while expanding against a constant pressure?

6. At what velocity (m/s) must a 20.0g object be moving in order to possess a kinetic energy of 1.00J?

7. What is the change in internal energy for a system that performs 213kJ of work on its surroundings and loses 79kJ of heat in the process?

8. Which one of the following is false concerning internal energy, E?
a. It is a state function.
b. It can be measured exactly.
c. $\Delta E = E_{final} - E_{initial}$
d. $\Delta E = q + w$
e. When a system undergoes a process in which it gains energy form the surroundings, the ΔE for the process is positive.

9. Given: heat (q), internal energy (E), work (w) and enthalpy (H), which one(s) is/are state functions? What does it mean to be a state function?

10. The energy change in a system that occurs at a constant pressure is _____, while the energy change in a system that occurs at a constant volume is _____. (Use ΔH, ΔE and q_p as potential answers)

11. Explain the difference between ΔE and ΔH.

12. An object possesses a gravitational potential energy of 600J at a height of 10.0m. What will its kinetic energy, potential energy and velocity be at 5.00m when it is dropped? (PE = mgh, KE = ½ mv^2)

13. Of the following types of energy, which are classified as kinetic energy?
    1. thermal energy
    2. mechanical energy
    3. electrical energy

    a) 1 only b) 2 only
    c) 3 only d) 2 and 3
    e) 1, 2, and 3

14. Which one of the following statements is INCORRECT?
    a) Energy is neither created nor destroyed in chemical reactions.
    b) Kinetic energy is the energy associated with motion.
    c) Exothermic processes transfer heat from the surrounding into the system.
    d) Increasing the thermal energy of a gas increases the motion of its atoms.
    e) Energy is the capacity to do work.

15. If the same amount of heat is added to 5.00 g samples of each of the metals below, which metal will experience the greatest temperature change?

Metal	Specific Heat Capicity (J/g·K)
Al	0.897
Au	0.129
Cu	0.385
Fe	0.449
K	0.753

    a) Al b) Au
    c) Cu d) Fe e) K

16. Which of the following statements is CORRECT?
    a) If a reaction occurs at constant pressure, $w = \Delta E$.
    b) If a reaction occurs at constant pressure, $q = \Delta H$.
    c) If a reaction occurs at constant pressure, $q = \Delta E$.
    d) If a reaction occurs at constant volume, $\Delta E > \Delta H$.
    e) If a reaction occurs at constant volume, $w = \Delta E$.

17. One statement of the first law of thermodynamics is that
    a) the amount of work done on a system is dependent of pathway.
    b) the total work done on a system must equal the heat absorbed by the system.
    c) the heat flow in or out of a system is independent of pathway.
    d) the total energy flow in or out of a system is equal to the sum of the heat transferred to or from the system and the work done by or on the system.
    e) in any chemical process the heat flow must equal the change in enthalpy.

18. A 2.885 g sample of methanol, CH_3OH, is combusted in a bomb calorimeter. The temperature of the calorimeter increases by 11.38 K. If the heat capacity of the bomb is 727.1 J/K and it contains 1.200 kg of water, what is the heat evolved per mole of methanol combusted? The specific heat capacity of water is 4.184 J/g·K and the molar mass of methanol is 32.04 g/mol.
    a) -65.41 kJ/mol
    b) -91.89 kJ/mol
    c) -634.5 kJ/mol
    d) -726.5 kJ/mol
    e) -1.019×10^6 kJ/mol

19. Which of the following chemical equations does not correspond to a standard molar enthalpy of formation?
    a) $Ca(s) + C(s) + 3/2\ O_2(g) \rightarrow CaCO_3(s)$
    b) $C(s) + 1/2\ O_2(g) \rightarrow CO(g)$
    c) $H_2(g) + 1/2\ O_2(g) \rightarrow H_2O(\lambda)$
    d) $N_2(g) + 2\ O_2(g) \rightarrow N_2O_4(g)$
    e) $SO_2(g) + 1/2\ O_2(g) \rightarrow SO_3(g)$

20. The standard molar enthalpy of formation of $NH_3(g)$ is -45.9 kJ/mol. What is the enthalpy change if 5.38 g $N_2(s)$ and 3.32 g $H_2(g)$ react to produce $NH_3(g)$?
    a) -75.6 kJ b) -50.4 kJ
    c) -17.6 kJ d) -8.81 kJ
    e) -1.20 kJ